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OF *CROTALUS CONFLUENTUS*,
THE PRAIRIE RATTLESNAKE

BY

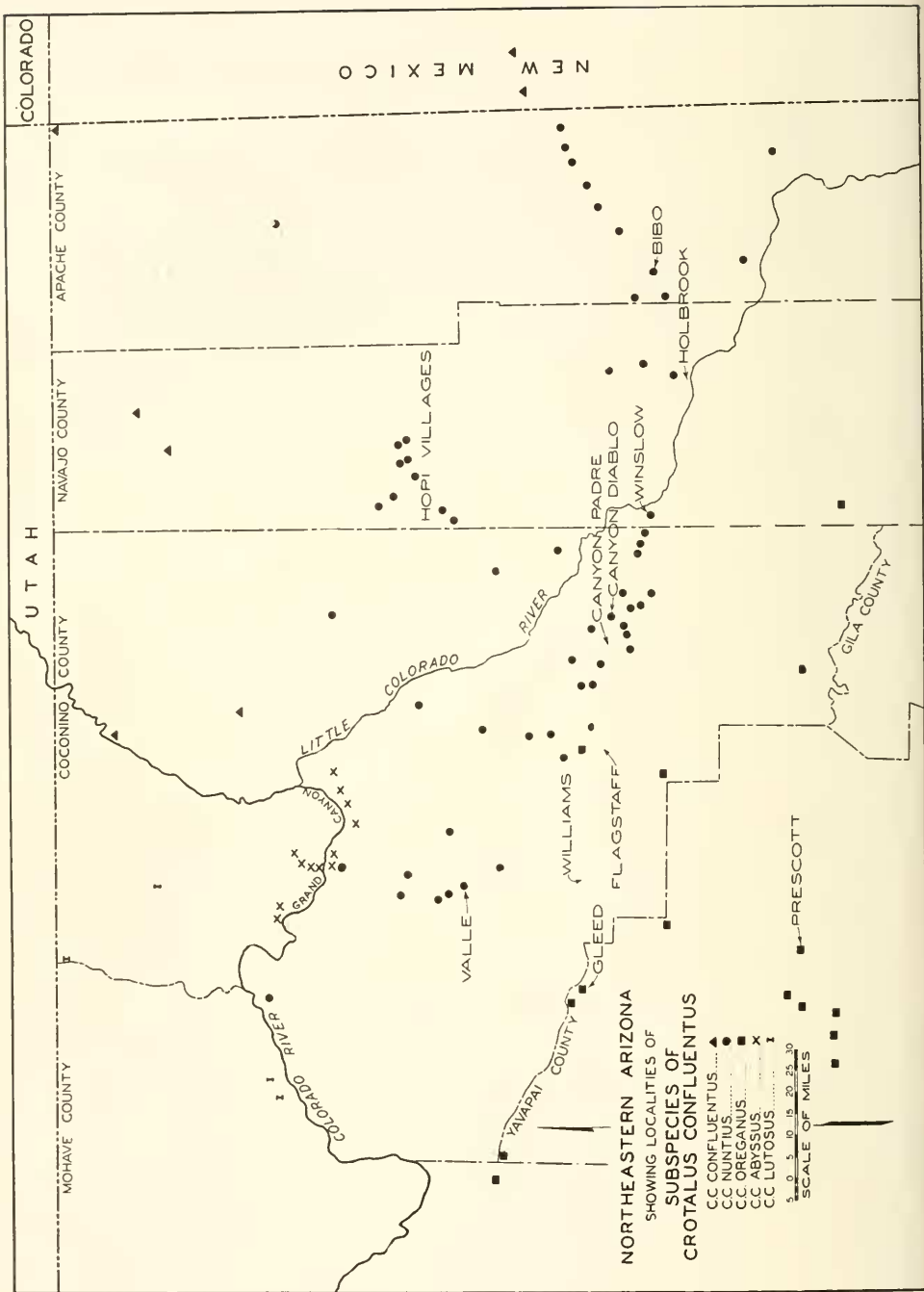
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A NEW SUBSPECIES OF *CROTALUS CONFLUENTUS*, THE PRAIRIE RATTLESNAKE

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It is with some hesitation that the writer proposes the differentiation of the Prairie Rattlesnake of the Little Colorado Basin and the surrounding territory in Arizona as a new subspecies of *Crotalus confluentus*. The latter is a wide-spread and rather variable snake; it has already been divided into five territorial races, e. g., *confluentus*, *abyssus*, *concolor*, *lutosus*, and *oreganus*. However, surveying the type subspecies *confluentus confluentus*, as now recognized, we find that the Arizona specimens differ from those inhabiting the rest of the range from Canada to Mexico in consistent and conspicuous characters.

I do not favor the indiscriminate splitting of reptile species in each instance where significant differences in some character can be found to exist between two or more geographical groups. Thus, specimens of *Crotalus confluentus oreganus* from Washington can be quite readily distinguished from southern California specimens by color and pattern; and it can be shown mathematically that Texas specimens of *Crotalus atrox* have a significant difference in such important characters as dorsal scale rows, ventrals, and labials from Arizona individuals. But, after all, these differences are largely technical; the snakes themselves are essentially the same, and it will serve no practical purpose to recognize each of such differences, with the multiplicity of subspecies that would result in plastic forms.

But the prairie rattlesnakes of Arizona, and particularly those found in the drainage area of the Little Colorado River, between Canyon Padre on the west and Bibo on the east, are so conspicuously different in size and color, and so significantly different in scale counts from the snakes found beyond the Continental Divide, that the divergence will appeal to the non-herpetologist as well as to the specialist. Venom data will be clarified by the recognition of this form, owing to the differences from the typical subspecies in yield, and possibly in quality as well. Thus it would seem that it is desirable to make this segregation.

It is true that there is some lack of uniformity in the specimens found in this area, so that the relationship pattern is not as clear as might be desired. Much of this may be attributed to a few inaccurate locality records, or to such effect as the religious rites of the Indians may have had upon distribution; but in any case, even if we consider all of the Arizona specimens (rather than only the stunted specimens from the Winslow area), we will still find a significant divergence, when comparisons are made with the type subspecies.

While the differences herein mentioned were first recognized in 1927, initially leading to some confusion with *C. tigris*, a discussion of the problem has been postponed until adequate material has become available. Studies have now been made of 200 Arizona specimens of this form, and scale counts of 1900 specimens of *confluentus confluentus* from other states are at hand for purposes of comparison.

***Crotalus confluentus nuntius*¹ subsp. nov.**

ARIZONA PRAIRIE RATTLESNAKE

Type.—No. 3105 in the collection of L. M. K. Collected at Canyon Diablo, Coconino County, Arizona, by R. L. Borden, August 9, 1930.

Diagnosis.—A stunted subspecies of *Crotalus confluentus*, predominantly reddish-brown in coloration and with low dorsal and ventral scale counts.

Description of Type.—Adult male. Length (live measurements) 468 mm. to rattles, tail length 38 mm., ratio 0.081. Length of head 24 mm., times contained in body length 19.5. Width of head 17 mm. Width across the supraoculars 11 mm., distance between supraoculars 4.5 mm., ratio 2.44.

The head is subtriangular, depressed, and, except for the supraoculars, covered with small scales. These are raised and unkeeled, excepting those in the temporal area and toward the neck.

The dorsal scale rows are 23-23-19; the first row dropped is the 6th, the second the 5th. At mid-body all scale rows are keeled, excepting the first two on either side. The central dorsal rows are smaller than the lateral; they are the more strongly keeled and have moderate posterior bosses. The ventrals number 166, and the caudals 26, in a single series. The anal is entire. The supralabials number 16-16; the infralabials 15-14. The rostral is higher than wide; eight scales contact it posteriorly, a first supralabial and prenasal on each side, and 4 internasals. Between the internasals and the supraoculars there are two canthals on each side. The scales on the top of the head, anterior to the supraoculars, number 18. The anterior intersupraoculars are 4+6; the anterior boundary of these scales is

¹ *Nuntius*, the messenger. In the Hopi Snake Ceremonial, these snakes are used as messengers to the gods of the underworld.

indefinite. The nasals are 2-2, the anterior larger; there are 0-1 loreals. The upper preocular contacts the prenasal on the left; on the right the contact is prevented by the juxtaposition of loreal and posterior canthal. There are two preoculars on either side, the upper larger, the lower crescent-shaped and bordering the pit above. The postoculars are 3-3, the total scales in the orbit, 8-9; scales from the labials to the orbit, 2+3, 2+4. The first and eighth supralabials are the largest. The small scales anterior to the pit number 4-3.

The first infralabials are undivided and are in contact on the median line; there are no intergenials. The mental is subtriangular, contacting only the first infralabials and a small submental. The genials are in a single pair, short and obtuse, and contact 4-5 infralabials.

The head above is light red-brown, irregularly spotted with darker. The supraoculars are crossed with light marks, widening inwardly. On the side of the head there is a light preocular stripe passing backward to the angle of the mouth, and a second narrower postocular light stripe, about $1\frac{1}{2}$ scales wide, the upper edge of which is rather indefinite. Between the two light stripes there is a dark ocular stripe about $2\frac{1}{2}$ scales wide ending above the commissure. The infralabials are punctated.

The ground color of the body is light reddish-brown, upon which there are superimposed 43 blotches of darker red-brown. On the sides there are secondary and tertiary series of ill-defined spots; posteriorly these are confluent with the dorsal series so that the last ten blotches become transverse rings, of a somewhat lighter color than the anterior blotches. The dorsal blotches are irregular both in shape and outline; at mid-body they are ellipses with the major axes transverse to the snake. They are about 11 scale rows wide, and longitudinally are 2 to 3 scales (end to end) long. The blotches are wider (along the body of the snake) than the interspaces. The blotches internally are somewhat darker at the borders than centrally; exteriorly there is a white edge, but this is neither regular nor always present. The blotch borders are independent of scale edges, which is typical of *confluentus* as opposed to *scutulatus*. The tail is crossed with 10 rings, all being brown except the last two, which are black, thus being in strong contrast with the rest of the body. The ventrals are straw colored, and somewhat punctated, particularly adjacent to the dorsals.

The rattles, of which 3 remain, measure about 7.3 mm. across. Studies of the rattles of this form indicate that there were not less than ten rattles in the complete string. The base of the rattles is black.

The hemipenis is completely bifurcate with divided sulcus. The base on the outer shoulders is covered with short, heavy spines, there being about 24 major spines on each shoulder, and some 55 smaller points. There are no spines in the crotch. The branches are covered with laminate fringes, there being about 27 on each lobe. The boundary between spines and fringes is sharply defined. The ratio between lobe length and diameter is 2.1, which is approximately the proportion usually found in *confluentus confluentus*.

General Description and Remarks.—The following is a summary of scale counts and measurements of 108 specimens from the area between Canyon Padre,

Coconino County, Arizona, on the west and Bibb, Apache County, Arizona, on the east, and will serve to indicate character variations in specimens from that area wherein this form adheres most closely to the type. Other Arizona specimens are subsequently discussed, but in this summary of the new subspecies it is deemed advisable to omit specimens which might be considered intergrades with other subspecies.

Size, small. Scale rows at midbody usually 23 (48 per cent) or 25 (50 per cent); rarely 21, 22, or 27 (less than 1 per cent of each). The scales are keeled, except the first two on the sides. Posterior scale bosses are not conspicuous. Ventrals: males, max. 181, min. 166, av. 172.29 ± 0.26 , interquartile range 170.1—174.5 (68 specimens); females, max. 182, min. 169, av. 177.51 ± 0.32 , interquartile range 175.5—179.5 (39 specimens). Anal entire. Caudals: males, 21 to 28, average of 68 specimens 24.8; females, 14 to 21, average of 39 specimens 18.5. These extremes are seldom attained; the males usually have from 23 to 26 and the females from 17 to 20. The caudals, while generally entire, may have a few at either end of the series divided.

The supralabials average 14.8; they usually number 15 (43 per cent), or 14 (30 per cent); occasionally 16 (18 per cent) or 13 (6 per cent); rarely 17 (less than 3 per cent). The infralabials average 15.3; they generally number 15 (38 per cent), 16 (35 per cent); occasionally 14 (18 per cent) or 17 (7 per cent); rarely 12 or 13 (less than 1 per cent of each).

The rostral is higher than wide, and in contact with the prenasals. The prenasals are always in contact with the supralabials. The internasals (scales in contact with the rostral between nasals, regardless of size or relative position) usually number 3, 4, or 5; rarely 2 or 6, the average being exactly 4. The scales on the crown, anterior to the supraoculars, vary from 12 to 31; the average is 20.2, with an interquartile range of 17.6 to 22.7. The minimum scale rows between supraoculars are usually 3 or 4, rarely 2 or 5, averaging 3.52. Supraocular sutures or indentations are not present.

The nasals are 2-2. About 90 per cent of the specimens have one loreal, the rest two or none; the upper is always the smaller when present. The scales along the *canthus rostralis* from internasals to supraoculars usually number two, rarely 1 or 3; the posterior is the largest of the series.

The upper preocular, which is the larger, is usually not in contact with the postnasal. In 82 per cent such contact is prevented by the contact of the post-canthal with the loreal, in 5 per cent by the presence of a small upper loreal.

The upper preocular is usually undivided; only in one instance is an upper corner cut off at the eye. The lower preocular is crescent shaped and constitutes the upper border of the pit. The small scales anterior to the pit usually number 3 to 5; they are not carried forward to the rostral.

The scale rows from labials to orbit usually number 2+3 or 2+2. Generally the 5th and 6th supralabials are the largest; however they do not conspicuously exceed the others in size. Usually the third and fourth are in contact with the lower pit border.

The first infralabials are usually undivided (only 5 per cent divided). Normally 4 are in contact with the genials on each side.

The mental is subtriangular. The genials are in a single pair, relatively short and obtuse, intergenials being present in 13 per cent. Also 13 per cent of the specimens have submentals.

The equation for the head length of *nuntius* approximates $H=0.0318L+7.7$, where the head and body length are given in millimeters. Thus a 500 mm. snake would have a head length of about 23.6 mm. L/H is, of course, not a constant, but closely approximates 21.2 in adults. The ratio of the distance across the supraoculars to the space between averages 2.64 (range 2.25 to 3.13) in 86 specimens.

The ratio of the length of tail to total length, exclusive of rattle, varies from about 0.065 to 0.089 in the males (average 0.077), and 0.045 to 0.074 in the females (average 0.056).

The largest preserved specimen examined measured 732 mm. (29 in.). The average size at birth is probably 165 mm. ($6\frac{1}{2}$ in.). Specimens exceeding 650 mm. (26 in.) are not common. The smallest gravid female measured 395 mm. ($15\frac{1}{2}$ in.).

In color the typical specimens from the Little Colorado Basin are pink, red-brown, brown, or gray-brown. Pinks predominate about Adamana and Holbrook; west of Dennison dark-brown is the typical color. Those from the vicinity of Moqui have an orange tinge. An occasional olive-brown specimen may be found in the vicinity of Winslow. Dark gray-brown specimens are found at Meteor Crater. The reddish hues tend to fade in preservative so that preserved specimens show less of this color than live material.

The head is rather brightly marked. Supraocular light cross-dashes are always in evidence in well preserved material; usually these are inwardly divergent. The postocular light line is $1\frac{1}{2}$ to 2 scales wide, thus being intermediate between typical *confluentus* and *oreganus*. The infralabials are punctated, otherwise the underside of the head is immaculate.

The body blotches number from 35 to 52, interquartile range 39.8 to 44.6, mean 42.2 ± 0.23 . The blotches are of the *confluentus confluentus* type, that is, the edges do not follow scale outlines. Longitudinally, they are wider than the interspaces. In shape they are highly irregular but are usually cross-ovals, rectangles, or figure-eights. The internal edges are darker than the blotch centers and are sometimes almost black; the external edges are lighter than the ground color and are sometimes almost white. Secondary and tertiary blotches, while usually present, are ill-defined. Caudad the blotches become transverse rings and are lighter than the anterior blotches.

The ventral surfaces are straw-colored. Usually the ends of the ventral scales are punctated, but they may be immaculate.

The tail rings vary from 5 to 12 (usually 8 to 11) in the males (average 9.4), and 5 to 10 (usually 6 to 8) in the females (average 7.3). The anterior rings are not in strong contrast to the ground color and are often ill-defined. The posterior rings (1 to 3) are black, in strong color contrast with the rest of the body, but are so poorly outlined as not to be conspicuous. The rattle matrix is black.

The rattles are small and delicate. The average widths of the first seven rattles in mm./10 are 43-50-60-69-73-80-82.

The hemipenis is completely bifurcate with divided sulcus. There are about 67 short spines on the shoulders; some are quite small so that the counting is not always accurate. There are no spines in the crotch. The lobes are covered with fringes which are laminate in front and reticulate in back, as is usual in *confluentus*. The fringes vary from 20 to 31; most specimens have from 25 to 29, the average being 27. This is distinctly lower than the *confluentus* average. The ratio of the lobe length to diameter is 2.2. The border between spines and fringes is sharply defined.

The venom yield is about 38 mg. of dry purified venom per fresh adult snake. The fang length, measured from upper lumen to tip, of a 500 mm. snake (head length 23.6 mm.) will closely approximate 4.1 mm.

Range.—Specimens of the typical stunted *nuntius* have been collected at the following points located along the line of the Santa Fe Railway or adjacent to U. S. Highway 66 between Canyon Padre, Coconino County, Arizona, on the west and Bibo, Apache County, Arizona, on the east:

COCONINO COUNTY:

Canyon Padre (at U. S. 66)
 Babbitt Tank
 7 mi. and 6 mi. W. of Two Guns
 (on U. S. 66)
 5 mi. E. of Canyon Padre (on
 U. S. 66)
 Canyon Diablo (Type locality;
 station on Santa Fe Railway)
 Two Guns
 4 mi. NW. of Meteor Crater
 Sunshine
 Dennison
 Moqui
 6 mi. W. of Winslow

NAVAJO COUNTY:

Winslow
 3, 6, and 22 mi. N. of Holbrook
 (Road to Keams Canyon)

APACHE COUNTY:

Adamana
 6 mi. N. of Adamana
 Bibo

This territory is an arid prairie about 4800 to 5200 feet in altitude; it is cut by deep arroyos, of which Canyon Diablo is the most conspicuous, and buttes are scattered about.

Discussion.—Having described and summarized the new subspecies, *nuntius*, two interrelated problems remain: First, the disposition of the specimens from those areas of Arizona outside the Canyon Padre-Bibo section, hitherto considered *confluentus confluentus*; and secondly, the relationship of the new form with the other *confluentus* subspecies.

Nuntius is clearly a stunted offshoot of *confluentus confluentus*; this is shown by the pattern on both head and body. The characteristic arrangement of

the head marks, the nature of the blotch edges, the number and form of the tail rings, all show a close affinity to the parent form. The difference between the two is found in the reduction in scale counts so often seen in stunted races. This may be exemplified by comparing the dorsal scale rows and ventral scales of the two forms. For our basic *confluentus confluentus* data we may use 875 specimens from Colorado, in which State the type specimen was collected. We have the following:

SCALE ROWS—PER CENT DISTRIBUTION²

	29	27	25	23	21
<i>Confluentus</i> (Colo.)	3	67	30		
<i>Nuntius</i>		1	50	48	1

The averages of the ventral scale counts are as follows:

AVERAGE VENTRAL SCALES

	Males	Females
<i>Confluentus</i> (Colo.)	178.84±0.10	185.73±0.11
<i>Nuntius</i>	172.29±0.26	177.51±0.32

In addition there are differences in color and size, although it is admitted that these characters are of less importance than scale counts, since they are more plastic. *Confluentus*, from its type area, is usually green or olive-green, while *nuntius* is pink or red-brown. A large adult male *confluentus* from Colorado will have a length of about 1000 mm.; in other parts of the range the size may exceed 1200 mm.; *nuntius* seldom exceeds 650 mm. The smallest Colorado female with eggs (out of 149 gravid females) was 588 mm. long; the smallest *nuntius* (out of only 6 gravid specimens) was 395 mm. Thus, without doubt, there is a real difference in adult size in these forms, a fact further validated by rattle studies.

Cope's *pulverulentus*³ does not anticipate *nuntius*; the type of the former is a large snake with 27 scale rows, although the ventral scale count is low for typical *confluentus*. The punctations and the number of intersupraoculars, which led Cope to describe this as a new subspecies, are found not to differ either in the type of *pulverulentus*, or in other specimens collected in the same area in New Mexico, from specimens of *confluentus* taken near its type locality in Colorado.

From *lutosus* we find *nuntius* to differ in size, pattern, color, number of ventrals, and number of scales on the snout before the supraoculars; and the same is true to a less extent in comparing *abyssus* and *nuntius*. Just as *nuntius* is a stunted form of *confluentus confluentus*, so *concolor* seems to be a stunted form of *lutosus*; *concolor* is superficially more like *nuntius* than is any other of the *confluentus* subspecies, although it is doubted whether the relationship is a direct one. In any case, they differ in color, pattern, and head scales, especially the number of scales before and between the supraoculars.

² Even rows are distributed equally to the next odd number above and below.

³ Proc. Acad. Nat. Sci. Phila., 1883, p. 11.

Nuntius differs from Arizona *oreganus* in color, pattern, and head scales.

These differences are discussed somewhat more in detail in considering the other specimens hitherto classified as *confluentus confluentus* from the area in northeastern Arizona surrounding the territory in which *nuntius* reaches its most typical development. Of these there are available 82 specimens from the following localities:

COCONINO COUNTY:

- *Lee's Ferry Bridge, South Side
- *Base of Echo Cliffs, near Cedar Ridge Trading Post
- Havasupai Point, South Rim, Grand Canyon
- El Tovar, Grand Canyon
- 15 mi. S. of El Tovar
- Red Butte
- 22 mi. N. of Williams (El Tovar Road)
- Anita
- Willaha
- 5 mi. N. of Valle
- Valle
- 36 mi. N. of Maine Sta.
- 12 mi. N. of Deadman's Flat
- Deadman's Flat
- Medicine Valley, NE. of San Francisco Mt.
- Near San Francisco Mt.
- Tanner Tank
- 15 and 20 mi. NE. of Flagstaff (Tolchaco Road)
- 7 mi. NE. of Leupp
- 12 mi. E. of Mouth of Moencopie Wash
- East Foot Monument Point
- 6 mi. E. of Flagstaff
- 1 mi. N. of Winona
- Angell

NAVAJO COUNTY:

- *Kayenta
- *Marsh Pass
- Shimopovi
- 8, 10 mi. S. of Oraibi (Road to Leupp)

APACHE COUNTY:

- *Four Corners
- 10 mi. NE. of Chin Lee
- Navajo
- Chambers
- Cheto
- 8 mi. E. of Sanders
- Houck
- 5 mi. W. of Lupton
- 40 mi. S. of Navajo
- 10 mi. NE. of St. Johns

* Of these localities, all should be considered to be within the range of *nuntius* except those marked*; those so marked are to be considered *confluentus confluentus*. (See map).

In addition the species has been observed at the Hopi villages of Hotevila, Oraibi, Shipaulovi, Mishongnovi, Toreva, Sichomovi, and Walpi.

The following specimens of *confluentus confluentus* or *nuntius* are contained in the U. S. National Museum: No. 5271 from Fort Buchanan, No. 8395 from Fort Apache, and No. 11879 from Fort Whipple. These three localities are in *oreganus* territory from which, in the last 25 years, no specimens of *confluentus* have been forthcoming. In the days when these snakes were collected it was the custom to label specimens with the name of the military post from which they were forwarded to the Smithsonian Institution. Sometimes the actual point of collection was some hundreds of miles away. It is therefore deemed advisable to omit consideration of these three specimens as being of uncertain locality.

Summarizing the situation it may be said that we have sufficient material, upon which to draw conclusions, from areas to the east and west of the Canyon Padre-Bibo area, but not from the north.

East of Bibo we have undoubted intergradation between *nuntius* and *confluentus confluentus*. As we pass through Navajo, Chambers, and Houck there is a gradual increase in body size, and a shift in color from pink through red-brown and olive-brown toward green. Twenty-five dorsal scale rows becomes the mode and there is a moderate increase in the dorsal scale count. At Gallup, New Mexico, larger, olive-green specimens with 25 scale rows predominate; these are to be considered *confluentus confluentus*, although the ventral scale counts are lower than in the typical form from Colorado.

This easterly intergradation is broad and gradual, for the habitat conditions change slowly; a sharp line of demarcation is not to be expected since true intergrades occur over a wide territory. Merely for purposes of allocation we may consider that the Arizona-New Mexico line (at U. S. 66) is the approximate location of the boundary between the forms; thus the Arizona specimens are assembled with *nuntius* rather than *confluentus confluentus*.

West of Canyon Padre the situation is not so simple. First, we have, at such points as Angell and Winona, small snakes only slightly larger than those from Winslow, but distinctly darker and more brightly marked. While the majority are dark-brown or red-brown, a few are olive-brown. The same situation exists at Deadman's Flat in the area northeast of the San Francisco Peaks. All of these snakes have low scale counts; they are clearly *nuntius*, differing only in color, and with a slight increase in size, from the typical specimens.

Proceeding further west we come to the Coconino Plateau, lying south of the Grand Canyon. A good series of specimens is available from Anita, Valle, and a few other scattered points round about. Here the snakes are superficially much more like *confluentus*. They are decidedly larger than typical *nuntius*. Browns predominate, with large dorsal blotches close together and without light edges; olive-greens and greens are likewise present. They are much punctated. Yet with all these *confluentus* tendencies, they are far from typical *confluentus*, for the dorsal and ventral scale counts are as low or lower than in *nuntius*. Thus, in these all-important characters they more nearly resemble the latter and will be so classified.

A few specimens are available from the south rim of the Grand Canyon; these show decided *abyssus* tendencies, particularly in high number of intersupraoculars and scales on the snout. Even the specimens from as far south as Anita show this tendency to a slight degree. Thus, I consider these snakes to be *nuntius*, intergradation with *abyssus* occurring at the south rim of the Canyon.

Also, in this Coconino Plateau area, we have the *nuntius-oreganus* relationship to determine, and this is the most difficult of all. A number of *oreganus* are available from the vicinity of Glead; these show undoubted resemblances to the Valle *nuntius*; two of them might almost be considered intergrades. The Valle specimens present some interesting tendencies as compared with the main group of *nuntius*, particularly in color and pattern, toward these Glead *oreganus*. Unfortunately, no specimens have been taken between Valle and Glead. Although the intervening territory is suitable to either subspecies, I do not affirm that intergradation occurs, for there are some differences in head scales which rather sharply divide the two. For instance, almost all the Glead specimens have the prenasals separated from the supraoculars, which is not the case with the Valle specimens.

Another uncertainty is the following: There are some areas, particularly in the vicinity of the San Francisco Mountains, where *nuntius* and *oreganus* have been taken so near to each other that an actual overlap is indicated. If this be the case they could hardly be expected to intergrade in the Valle-Glead territory. Only the receipt of additional material can resolve this doubt.

It may be of interest to note that the actual and direct intergradation of *oreganus* and *confluentus confluentus*, although possible in central Idaho or west-central New Mexico has not yet been demonstrated. It may occur through *lutosus* in southern Idaho; the *lutosus-oreganus* intergradation is demonstrated near the Oregon border, but the *confluentus-lutosus* merger is not. Thus, the most certain intergradation (as known today) of the two terminal forms, *oreganus* and *confluentus*, is that via the detour *confluentus*, *nuntius*, *abyssus*, *lutosus*, *oreganus*, and this is not as certain as is desirable.

Lastly there arises the question as to the classification of the prairie rattlers found to the north of the Little Colorado Basin. Of these unfortunately we have insufficient specimens to determine their position definitely. The situation is further complicated by the fact that the Hopi Indians use these rattlesnakes in their Snake Dance and sometimes have brought in specimens from distant points. On one occasion when I saw the dance there was a mixture of "large greens" and typical *nuntius*. In scale counts the snakes of this north area are more like *confluentus confluentus* than those from the vicinity of Gallup or the Coconino Plateau, this being especially true of the specimens from beyond the Hopi Reservation to the north. Thus, tentatively, I am disposed to consider the snakes of the extreme northeastern corner of Arizona (i. e., the San Juan drainage area) as *confluentus confluentus* rather than *nuntius*. This would also seem to prevent direct intergradation between *nuntius* and *concolor*. A definite decision on this relationship cannot be made until more specimens are available from the San Juan basin, and especially along the San Juan River, from which two or three peculiar specimens have been seen.

Conclusion.—*Crotalus confluentus nuntius* is described as a new subspecies. It is a stunted form reaching its most typical development in the Winslow-Holbrook area in Arizona. Eastward it intergrades with *C. c. confluentus* and westward, at the south rim of the Grand Canyon, with *abyssus*. It may intergrade with *oreganus* southwest of the Coconino Plateau. The snakes of the San Juan basin in Arizona are of uncertain status, but are probably *C. c. confluentus*.

PLATE 8

Fig. 1. Comparison of adult *Crotalus confluentus nuntius* (left) with adult *C. c. confluentus* (right). The former is from near Winslow, Arizona; the latter from Kansas.

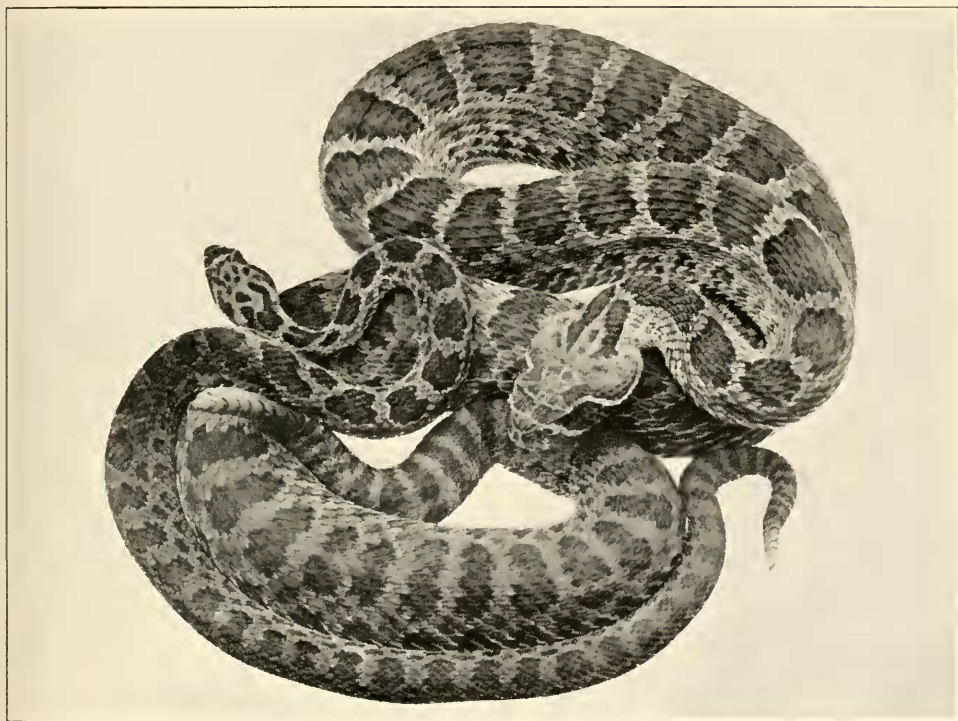


Fig. 1

